Langley Research Center
DIRECTIVES MANAGEMENT
TRANSMITTAL SHEET

LPR 1710.10

MATERIAL TRANSMITTED

LPR 1710.10, Langley Research Center Energy Control Program (Lockout/Tagout)

RECISION

LPR 1710.10, “Safety Clearance Procedures for the Control of Hazardous Energy (Lockout/Tagout),” dated January 14, 2005.

SUMMARY

This directive has been rewritten to simplify the program while still ensuring the safety and health of Center employees.

Langley Research Center

LPR 1710.10

Effective Date: _____

Expiration Date: _____

LANGLEY RESEARCH CENTER ENERGY CONTROL PROGRAM (LOCKOUT/TAGOUT)

National Aeronautics and Space Administration

Responsible Office: Safety and Mission Assurance Office

PREFACE

P.1 PURPOSE

This Langley Research Center Procedural Requirements (LPR) establishes a Lockout/Tagout (LOTO) program for controlling hazardous energy sources where the unexpected start up or release of stored energy could cause injury to employees or damage to equipment. This LPR is a part of the LaRC safety program and is intended to assist supervisors and employees with their individual responsibility for safety.

P.2 APPLICABILITY

a. This program is applicable to all persons including all contractors at Langley Research Center (LaRC) performing maintenance, repair or servicing activities as covered in the Occupational Safety and Health Administration (OSHA) standards 29 CFR 1910.147, OSHA 29 CFR 1910.333(b)(2), and OSHA 29 CFR 1910.269 (d).

b. Non-compliance with this LPR will result in appropriate disciplinary action that may result in termination of a civil servant employee or exclusion from the Center for all other personnel.

P.3 AUTHORITY

a. NPR 8715.3, “NASA Safety Manual.”

P.4 APPLICABLE DOCUMENTS

a. OSHA standard 29 CFR 1910, "Occupational Safety and Health Standards."
b. NASA Langley Procedural Requirement LPR 1710.6, “Electrical Safety.”
c. NASA Langley Form 519, "Employee Safety Operator Field Verifier Appointment Form."
d. NASA Langley Form 493, "Lockout/Tagout Release."
e. NASA Langley Form 451, "Safety Operator Appointment Form."
f. NASA Langley Form 453, "NASA Langley Safety Operator's Permit."
g. NASA Langley Form 495, "Energy Control Procedure."
h. NASA Langley Form 496, "Lockout/Tagout Records."
i. NASA Langley Form 416, “LaRC Energized Electrical Work Permit

P.5 CANCELLATION

LPR 1710.10, dated January 14, 2005, is rescinded and should be destroyed.

Lesa B. Roe
Director

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Chapter 1

1. INTRODUCTION

1.1 SCOPE

The potential for energy related injury or property damage when servicing machines, equipment or systems at LaRC is ever present. The degree of risk is directly related to the work to be performed and the complexity of the controls required. Compliance with the requirements of this LPR will provide adequate protection; however, these procedures only provide a minimum standard. Responsible individuals should always strive to improve upon this standard by assessing risk on a continuous basis.

1.2 APPLICATION

a. These program requirements are applicable anytime the unexpected release of hazardous energy may result in injury to personnel or damage to property during servicing or maintenance activities.

b. These requirements do **not** apply to:

(1). An “Administrative” control, see LPR 1740.2 (8.1.11)”Facility Safety Requirements” examples include:

(a). A locked fence around high-voltage switching station.
(b). A lock on an overhead crane disconnect switch. (To keep individuals off of equipment or out of an area for anything other than maintenance, repair or service.)
(c). A locked door to a laser or chemical laboratory.
(d). Locked equipment that is out of use for an indefinite period of time.
(e). A locked facility or a system that is deactivated or mothballed.
(Note: Locks used in the applications above should not be the same lock used in lockout tagout procedures.)

(2). Work during normal operation of a machine, equipment or system unless a person is required to remove or bypass installed guards or safety devices or required to place any part of his or her body in the danger zone or point of operation of any machine or equipment that may exist during the normal operating a cycle. In such cases, controls must be provided to ensure the safety of exposed personnel to a level consistent with this LPR. (See OSHA 29 CFR1910.147(a)(2)(ii))

(3). Work on energy generating facilities or the transmission and distribution lines and equipment for electricity, natural gas, liquid nitrogen, water, steam or any other energy that are under the **exclusive** control of the respective commercial utility owner.

(4). Work on “cord and plug connected” equipment where the hazard of the unexpected de-energization or startup is controlled by removing the plug from the receptacle and the plug remaining in the exclusive control of the employee performing the maintenance, repair or servicing activity. (Note: exclusive control only applies to plug and cord connected equipment and means the plug is within arm’s reach and sight of the employee performing the servicing and maintenance activity).

(5). Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water or petroleum products when they are performed on pressurized pipelines, provided that the organization demonstrates that:

(a). Continuity of service is essential,
(b). Shutdown of the system is impractical, and
(c). Documented procedures are followed, and special equipment is used, which will provide proven effective protection for employees.

(6). Energized electrical work where de-energizing equipment introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. The limitations include:

- Life support equipment
- Testing of circuits that can only be performed while the circuit is energized.
- Work on circuits that formed an integral part of a continuous process that otherwise need to be completely shut down to work on one circuit.

This exception requires issuance of a NASA Langley Form 416, “LaRC Energized Electrical Work Permit” in accordance with LPR 1710.6, Electrical Safety Program.

(7). New Construction Activities with special approval – In special circumstances the Safety and Facility Assurance Branch (SFAB) may allow the use of the Contractors LO/TO process in lieu of LPR 1710.10. It is always preferred to use LPR 1710.10 and this special approval is intended for situations under the contractors’ control (before delivery to the government) during the commissioning or start-up phase. The Contractors process must meet requirements of OSHA 29 CFR 1926.417, OSHA 29 CFR 1910.147 and OSHA 29 CFR 1910.269(d). Approval will be granted on a case-by-case basis after considering issues such as:

- Well defined physical and functional boundary between existing Center operations and or facilities (control of energy sources between existing LaRC facilities and the new facility under construction).
- Personnel that are best qualified to understand and control the energy at the new facility during the construction project.

1.3 REQUIREMENT

This LPR establishes compliance with Lockout/Tagout requirements of OSHA 29 CFR 1910.147, "The Control of Hazardous Energy (Lockout/Tagout)", paragraph (d) of OSHA 29 CFR 1910.269, “Electric power generation, transmission and distribution” and NPR 8715.3C “NASA General Safety Program Requirements”

Chapter 2

2. GENERAL POLICY

2.1 INTRODUCTION

At LaRC the majority of the energy isolation devices are electrical switches or mechanical shut off valves. It is rare to find an energy source that cannot be isolated and locked and for this reason, the LaRC policy is to lock and tag an isolation device if at all possible rather than using just a tag or alternative means of control. There are other forms of energy that should be considered, the following is a limited list that does not include all possible energy sources and hazards:

- The energy associated with large springs, lifting devices, rotating parts, or large roll-up garage doors.
- Corrosive chemicals.
- Toxic chemicals/materials.
- Asphyxiates – oxygen deficiencies
- Materials/compounds/equipment that burn (temperature exceeds150° F.)
- Cryogenic liquids/systems
- Hydraulic/pneumatic, etc. that may need to be controlled by unique devices.
- Injuries caused from sudden pressurization/depressurization.
- Electrical

2.2 LOCKING and TAGGING (LO/TO)

Anytime an employee performs maintenance, repair or service tasks on machines, equipment or systems, they shall be protected from injury by locking and tagging the appropriate energy-isolating device(s). Specific procedures are contained in Chapter 3 of this LPR.

At LaRC only Safety Operators (SO) are authorized to lockout or tagout machines, equipment or systems. The SO shall determine the hazards, energy sources, and the valves or switches that need to be closed or opened, etc., to provide a safe environment. It shall be done, in conjunction with other knowledgeable and experienced personnel, by review of drawings, piping and instrumentation documentation, specifications, other means and by a physical inspection of the machine, equipment or system.

If a SO feels they have insufficient knowledge or experience with the system they have been asked to lockout they have the authority and responsibility to disqualify themselves from performing the LO/TO.

2.3 TAGOUT WITHOUT LOCKING

If an energy isolating device is not capable of being locked, it shall be the responsibility of the applicable organization, with the approval of LaRC Safety Manager or his/her

designee, to implement alternative procedures and controls that meet the requirements of OSHA 29 CFR 1910.147(c)(2), (c)(7)(ii) and (d)(4).

2.4 LO/TO METHODS

a. The three lockout methods approved for use at LaRC are:

(1). Red Lock/Red Tag (RL/RT)
(2). Craft Specific (CS)
(3). Shop Machine (SM)

b. The following apply to the use of these three methods:

(1). The RL/RT method is acceptable for locking out any machine, equipment or system. The lockout shall be performed by an authorized Safety Operator and documented on NASA Langley Form 496 “LO/TO Records”, it is a register used to establish the status, isolation, procedure, responsible employees and other useful information about a lock out. See Section 3.5.2 for details.

(a). A RL/RT lockout is identifiable by the red tag affixed to the lockout device with the red lock.

(2). The CS method is acceptable for short duration servicing and maintenance activities, such as building HVAC or electrical work that can be completed in one work shift. It shall only be used if:

(a). **All of the exception elements** of paragraph 2.4.1 of this LPR are met.

(b). The employee(s) applying the lockout is an authorized Craft Specific Safety Operator and the only employee(s) performing the servicing or maintenance. See Section 3.3 for procedures.

(c). The CS lockout is identifiable by the Craft Specific Safety Operators Blue authorization card affixed to the lockout device with the red lock.

(3). The SM method shall only be used when locking out permanently installed shop machines if:

(a). **All of the exception elements** of paragraph 2.4.1 of this LPR are met.

(b). The employee(s) applying the lockout is an authorized Shop Machine Operator and the only employee(s) servicing the machine. See Section 3.4 for details.

(c). The shop machine has a LO/TO procedure posted on or near the machine.

(d). The SM lockout is identifiable by the Shop Machine Operators Yellow authorization card affixed to the lockout device with the red lock.

2.4.1 ENERGY CONTROL PROCEDURE WAIVER

The RL/RT method requires that a written procedure for each lockout event be documented on NASA Langley Form 495 per Section 3.5.1 of this LPR unless **all of the following elements exist**:

a. The machine or equipment has no potential for stored or residual energy (or re-accumulation of stored energy after shut down).

b. The machine or equipment has a single energy source, which can be readily identified and isolated.

c. The isolation and lock out of that energy source will completely de-energize and deactivate the machine or equipment.

d. An electrical isolation device must be locked out by an electrical SO. Not by a mechanical SO authorized to perform electrical lockouts for non-electrical work.

e. The machine or equipment is isolated from that energy source and locked out during maintenance, repair or service.

f. A single lockout device will achieve a locked-out condition.

g. The lockout device is under the exclusive control of the employee performing the work.

h. The work does not create hazards for other employees.

i. The organization and/or Safety Operator utilizing this exception, has had no accidents involving the unexpected activation or re-energization of the machine, equipment or system during maintenance, repair or servicing.

2.5 DEVICE/HARDWARE STANDARD

In accordance with OSHA 29 CFR 1910.147(c) (5), the locking hardware (locks, tags, isolation control devices, etc.) shall be durable, standardized, substantially constructed and readily identifiable and shall not be used for any other purpose. For this reason, the Safety and Facility Assurance Branch (SFAB) shall either purchase or approve the purchase of all lockout hardware. The tags will normally be attached through the eye of the tag and the lock shank. If the tag cannot be attached to the lock they shall be attached near the lock using a nylon cable tie capable of supporting atleast 50lbs. The locks and tags used at LaRC shall meet the following:

- RL/RT method
    - Red Lock
    - Red Tag

- CS method
    - Red Lock
    - Blue Identification Card
- SM method
    - Red Lock
    - Yellow Identification Card

Administrative locks and tags used for control purposes at LaRC shall meet the following:

- Administrative
    - White lock
    - White Tag

(Note: See 1.2.b.1 for Administrative Lock requirements)

2.6 RESPONSIBILITIES

2.6.1 SAFETY AND FACILITY ASSURANCE BRANCH (SFAB) shall:

a. Develop and maintain the procedural requirements of this LPR.

b. Initiate and participate in periodic inspections (at least annual) of lockout Energy Control Procedures.

c. Procure and/or approve purchases of all lockout hardware.

d. Provide and verify training relating to this LPR.

e. Assure all new equipment installed or major repair, renovations or modifications after January 2, 1990 is capable of being locked out. (See OSHA 29 CFR 1910.147(2)(2)(iii).

2.6.2 ORGANIZATIONAL UNIT MANAGERS (OUMs) shall:

a. Provide employees the opportunity to attend training related to this LPR.

b. Investigate any violations of this LPR and implement corrective and disciplinary action as appropriate.

2.6.3 SUPERVISORS shall:

a. Become familiar with this LPR and how it effects their organization.

b. Initiate requests for Safety Operator and Field Verifier appointments associated with this LPR.

c. Provide for and document technical safety training related to the machine, system and energy sources that are requested to be locked out.

d. Periodically, at least annually, inspect (maintain a record of the inspection) the Energy Control Procedures and associated document.

e. Attend required annual supervisors refresher training.

2.6.4 FACILITY COORDINATORS (FC) shall:

a. Maintain the lockout hardware, red tags and locks necessary for the lockouts in their facility.

b. Maintain the lockout documentation during and after a lockout has occurred.

c. Understand the equipment in their facilities and how lockouts affect other occupants so that they may communicate warnings as appropriate (see section 2.7 COMMUNICATIONS).

d. Approve the Energy Control Procedure, NASA Langley Form 495, relating to the locking and tagging of equipment or systems in their facilities.

e. Accept the red tag stub and key from the Protected or Responsible employee when protection is no longer required and return them to the Safety Operator that is removing the lockout condition.

f. Be responsible for communicating with all in the area and those employees involved with the lockout.

g. Attend required annual LO/TO training.

h. Ensure records/documentation is independently inspected at least annually.

2.6.5 LaRC DUTY OFFICER shall:

a. Maintain lockout hardware and NASA Langley Form 496, “Lockout/Tagout Records,” for use after hours and for facilities that do not maintain hardware and record forms.

b. In an emergency, apply an administrative lock, where necessary.

c. Notify the appropriate FC of any lock placed in their facility after normal duty hours. This will normally be done at the beginning of the next duty day.

d. Attend annual LO/TO training.

2.6.6 FACILITY SAFETY HEAD shall:

a. Become familiar with this LPR and how it affects their organization/facility.

b. Attend annual LO/TO training.

2.6.7 SAFETY OPERATORS (SO) shall:

a. Possess a current permit, and have it on-hand or readily accessible, as proof of their authorization, while performing lockouts.

b. Lockout equipment or systems in accordance with the requirements of this LPR.

c. Fully understand hazardous energy associated with the equipment and systems they are authorized to lockout.

d. Disqualify themselves from performing the LO/TO if they feel they lack the certainty (knowledge or experience) of safely locking out a system they have been asked to lockout. SO's have the authority and responsibility to do so.

e. Attend required LO/TO training.

f. Re-apply for certification every 4 years.

g. When requested participate in the inspection of a lockout performed by another Safety Operator.

h. Approve the Energy Control Procedure relating to the locking and tagging of equipment or systems they are authorized to lockout.

i. Record/document pertinent information onto the Red Tag and NASA Langley Form 496.

j. Issue the red tag stub to the responsible employee after assuring he/she has verified that isolation and de-energization has been accomplished and after providing them instructions/training about the lockout process, their responsibilities the hazard controls and any other safety concerns associated with the lockout.

k. Communicate with other employees involved with lockout about the hazards, controls and any other safety concerns that may affect them.

2.6.8 RESPONSIBLE EMPLOYEE shall:

a. Assume overall responsibility for a RL/RT lockout when two or more employees are performing a lockout activity.

b. Have complete knowledge of the Energy Control Procedure being implemented.

c. Have their name registered in the Lockout/Tagout Record, NASA Langley Form 496 and on both parts of the Red Tag.

d. Be knowledgeable of the roles of the Safety Operator(s) applying the lockout.

e. Accept the red tag stub from the Safety Operator after reviewing the procedures and verifying that the isolation and de-energization has been accomplished and receiving instructions/training from the SO about the lockout process, your responsibilities the hazard controls and any other safety concerns associated with the lockout.

f. Place the red tag stub in the lock box and lock it with his/her personal lock.

g. Know the location, assignments and exposure status of all the Protected Employees you assume responsibility for. For large groups this will require maintaining a list of the Protected Employees, their work location and status of their personal locks.

h. Communicate with the SO(s), FC's, and Protected employees.

i. Ensure the Protected Employees has received instruction/training about the Energy Control Procedure and this LPR (Program) as it pertains to their personal safety and protection.

j. Ensure the protected employees are given the opportunity to verify that isolation and de-energization has been accomplished.

2.6.9 PROTECTED EMPLOYEE shall:

a. Meet the applicable requirements of the Responsible Employee when you are the only employee is being protected under the lockout procedure.

b. Be familiar with the specific hazards and isolation devices associated with the system lockout prior to beginning work.

c. Have received instructions/training from the SO or Responsible Employee about the lockout process, your responsibilities the hazard controls and any other safety concerns associated with the lockout before beginning work.

d. Ensure that his/her personal lock is in place on the lock box before commencing work.

e. Have the opportunity to verify that all hazardous energy has been isolated and controlled.

f. Ensure that his/her lock remains in place until protection is no longer required.

2.7 COMMUNICATIONS

Whether implementing the RL/RT, CS or SM lockout method, the employees involved with the lockout shall initiate discussions and continue to communicate as necessary until the lockout condition is lifted. As a minimum, the following communication protocol shall take place:

a. Discussion between the FC or their designee and the SO(s) shall take place prior to initiating the lockout. The FC is expected to be familiar with their facility and may be able to provide additional insight to ensure no additional hazards are created because of the lockout. To promote a safe working environment during lockout it is necessary that they understand each others responsibilities and interactions with the Responsible and Protected employees. They shall also warn other employees (*affected employees*) that work in the area but are not directly involved with the lockout about any hazards that exist because of the lockout.

b. Immediate notification to the FC or their designee of any problems that arise during the lockout that will affect operations within the facility.

c. Final communication between the FC or their designee and the SO(s) prior to removing the lockout.

d. Warning from the FC or designee to all the employees in the area prior to re-energizing the system.

e. Status briefing to the incoming Responsible employee and crew when shift work is involved. Shift work may also involve changes in the status of affected employees and may require that additional warnings be made. The FC or Responsible employee will determine the need and implement the warnings.

f. Communications in the form of a training briefing shall be provided to the Responsible and Protected employee(s). The training briefing shall be specific to the hazards and controls for the lockout they will be working under. See Section 3.2(k).

2.8 TRAINING REQUIREMENTS

All LaRC employees and contractors shall receive the appropriate training and retraining in the Energy Control Program, LPR 1710.10. The training content and frequency is determined by the employee's Lockout/Tagout responsibilities.

2.8.1 All Center employees receive yearly safety awareness training. A portion of that training covers the basic do's and don'ts of LO/TO. It presents the message of when

should a machine, equipment or system be locked out, by whom, and what you should be aware of if you come across a lockout.

2.8.2 Construction and maintence sub-contractors receive a safety briefing before they are allowed to work on Center. The briefing is good for six months and a portion of the briefing delivers the following LO/TO message:

- When a lockout should be applied.
- Only LaRC's program is applicable on Center unless they are not applicable per section 2.1 (b) 7.
- Only a LaRC authorized Safety Operators can perform and release a lockout.
- Individuals that need LO/TO protection will require additional training specific to the LO/TO they will be working under.

2.8.3 Protected Employees – In addition to either the yearly safety awareness training or the sub-contractor training, Protected Employees must receive instructions/training specific to the LO/TO they will be working under. The training will address their rights and responsibilities, see section 2.6.9 of this LPR.

2.8.4 The Safety Operators, Safety Heads, Shop Machine Operators and Facility Coordinators must take yearly LO/TO training that cover the requirements of this LPR.

2.8.5 Safety Operators – LaRC's Energy Control Program, LPR 1710.10, relies on the SOs to identify and control hazardous energy and thus provide protection to employee's working under a lockout. For this reason the SO's training requirements are the most demanding. In addition to the yearly training described above in section 2.8.4 above, the SO's shall:

- Meet the minimum training and or experience requirements specified in section 4.3 of this LPR.
- Demonstrate competency of this LPR by passing a written test administered by the Safety and Facility Assurance Branch.
- Demonstrate through field verification the ability to implement the requirements of this LPR, identify hazardous energy sources, isolate and de-energize machines, equipment or systems from those energy sources.

Chapter 3

3. APPLICATION OF PROGRAM CONTROLS

3.1 INTRODUCTION

Standardization of how energy sources are controlled will provide a safer work environment. The following controls, when applied, will reduce energy related risks to an acceptable level at LaRC. Before applying the controls in this chapter one must first determine which method of lockout applies to the work being performed (See paragraph 2.4 of this LPR).

3.2 RED LOCK/RED TAG (RL/RT) LOCKOUT CONTROLS

a. Assess energy source, identify hazards and determine which isolation control devices require lockout.

b. Prepare an Energy Control Procedure using NASA Langley Form 495 unless all requirements of paragraph 2.4.1 are met. If the work involves a group lockout make sure that Responsible Employee(s) are shown by name NASA Langley Form 496, "Lockout/Tagout Records." and both parts of the red tag.

c. Ensure discussions occur between the FC or their designee and the Safety Operator about the pending lockout.

d. Obtain approval of the NASA Langley Form 495 from each of the Safety Operator(s) participating in the lockout, the Facility Coordinator, Responsible Employee(s) and another employee acceptable to the SO as being knowledgeable of the system being locked-out.

e. Safety Operator isolates energy sources; releases stored energy (if any) and installs locks and tags. See paragraph 3.5.3 for more information on tags.

f. Before releasing the red tag stub to the Responsible employee the Safety Operator verifies that isolation and deenergization of the machine/equipment or system have been accomplished.

g. Safety Operator tears off the bottom section (stub) of the red identification tag and gives it, to the Responsible employee and provides instructions/training about the lockout process, their responsibilities the hazard controls and any other safety concerns associated with the lockout.

h.

i. The red identification tag stub shall be placed in a lock box and secured with the personal lock of the Responsible Employee and personal locks from everyone that is being protected and working under the control of the Responsible Employee.

j. Safety Operator documents the lockout on NASA Langley Form 496. See paragraph 3.5.2 for more information on this form.

k. Safety Operator, Facility Coordinator or Responsible Employee notifies employees in the vicinity of the lockout that a lockout is in progress.

l. The Safety Operator or Responsible Employee provides a training briefing to Protected Employees prior to commencing work. The briefing shall include as a minimum:

(1). Information about the energy source(s) and the associated hazard(s), the control(s), the location of the controls, and who locked-out the isolation control device.
(2). Who is leading (Responsible Employee) the lockout, who they shall notify with concerns and who they shall notify when they have finished the task and no longer require protection.
(3). An opportunity to understand the Energy Control Procedure and verify that the isolation and de-energization of the machine/equipment and or system have been accomplished.
(4). An understanding that they are required to lock their personal lock on the lockbox and remove it when they no longer require protection.

m. As protected employees complete their tasks, the Responsible Employee shall inspect their work area to verify that system components have been properly reassembled and then they can remove their personal lock from the lock box.

n. The last personal lock to be removed shall be the Responsible Employees. The Responsible Employee shall take the red tag stub from the lock box and return it to the Facility Coordinator or Safety Operator.

o. Multiple shift lock outs - Some jobs will require more than one shift for completion.
- Personal locks may, with agreement from the Responsible individual, be left on the lockbox. That employee must verify that their lock is still on the lock box prior to starting work on subsequent shifts.
- The Personal lock of the Responsible employee shall remain locked on the lock box until the work is completed and they are ready to reunite the red tag stub with the tag on the energy control device.
- The crew leader for the out-going shift shall communicate with the on-coming shift to verify the current lockout condition.

p. The FC or their designee along with the Responsible Employee shall verify that the system has been properly reassembled, the servicing work is completed and employees no longer need lockout protection.

q. The red tag stub is reunited with the red tag on the energy control device. To notify all parties that the work is completed and the lock out can be lifted the red tag stub should pass from the Responsible employee to the FC or their designee to the Safety Operator that will lift the lock out.

r. Employees in the vicinity of the lockout shall be notified that the lockout is being lifted.

s. A Safety Operator shall unlock the red lock and control device and notify the Facility Coordinator that the system is no longer under lockout.

t. Document the lockout release on the NASA Langley Form 496.

u. Temporary Removal - In situations in which lockout devices shall be temporarily removed from the isolating device and the machine/equipment or system energized to test or position the machine the following sequence of actions shall be followed:

(1). Release from Lockout as stated above.
(2). Energize and proceed with testing or positioning.
(3). De-energize the system and reapply energy control measures, in accordance with the RL/RT lockout controls specified in this section (3.2) or the approved Energy Control Procedure.

3.3 CRAFT SPECIFIC LOCKOUT PROCEDURES

a. Assess energy risks, identify hazards and determine which isolation control device requires lockout.

b. Notify the FC or their designee of the pending lockout and discuss any issues, concerns and schedule.

c. Craft Specific Safety Operator (CSSO) notifies employees in the vicinity of the lockout that a lockout is in progress.

d. Isolate energy source; release stored energy and install red locks and blue identification card. Each person protected by the CS lockout shall be an authorized CSSO and shall have placed their red lock with identification card on the lockout device.

e. CSSO’s verifies effectiveness of lockout/ tagout by attempting start-up.

f. Once work is complete, the CSSO shall verify that the system has been properly reassembled and that all employees are safe.

g. The FC or their designee shall be notified that the system is being returned to its pre-lockout condition.

h. The CSSO notifies employees in the vicinity of the lockout that a restart is in progress.

i. The CSSO unlocks the red lock and allows the system to be restarted.

j. Temporary Removal - In situations in which lockout devices shall be temporarily removed from the isolating device and the machine/equipment or system energized to test or position the machine the following sequence of actions shall be followed:

(1). Release from Lockout as stated above.
(2). Energize and proceed with testing or positioning.
(3). De-energize the system and reapply energy control measures per paragraph (d) and (e) of this section.

k. The lockout applied by a CSSO(s) shall not extend beyond one work shift. If the servicing cannot be completed in one work shift then the CSSO(s) for the on-coming shift may transfer their blue identification card(s) with that of the out-going CSSO(s) or the lockout shall be transferred to the Red Lock/Red Tag method.

3.4 SHOP MACHINE LOCKOUT PROCEDURES

a. Assess energy sources, identify hazards, and verify/review the posted shut down and lockout procedure posted for the machine.

b. Shop Machine Operator (SMO) notifies employees in the vicinity of the lockout that a lockout is in progress.

c. Isolate energy source; release stored energy and install red locks and SMO's yellow identification card. Each person protected by the SM lockout shall be an authorized SM Operator and shall have placed their red lock with yellow identification card on the lockout device.

d. SMO verifies effectiveness of lockout/tagout by attempting start-up.

e. Once work is complete, the SMO shall verify that the system has been properly reassembled and notifies employees in the vicinity of the lockout that a restart is in progress.

f. The SMO unlocks the red lock and allows the system to be restarted.

3.5 DOCUMENTATION

a. The following documents are associated with the application and removal of lockout devices are:

(1). NASA Langley Form 493, "Lockout/Tagout Release"
(2). NASA Langley Form 495, "Energy Control Procedure"
(3). NASA Langley Form 496, "Lockout/Tagout Records"
(4). Red Identification Tag
(5). Blue Identification card
(6). Yellow Identification card
(7). Green Safety operation authorization card

b. Facility Coordinators shall maintain and have a designated location where the lockout hardware and documentation is kept. All documentation relating to a specific lockout event shall be maintained by the organization for at least one year.

3.5.1 NASA Langley Form 495, Energy Control Procedure

a. The Energy Control Procedure and the red identification tag(s) shall be unique to the specific machine, piece of equipment or system and the service or maintenance being performed. The Energy Control Procedure shall be reviewed and approved prior to each use.

b. NASA Langley Form 495 shall be used to document the Energy Control Procedure. When necessary, NASA Langley Form 495 can reference a continuation sheet but the procedures shall clearly and specifically identify the following:

(1). A unique identification number and date of review and approval.

(2). The machine, piece of equipment or system along with the facility location.

(3). The type and magnitude of the energy that employees may potentially be exposed.

(4). The hazard(s) associated with the energy.

(5). The steps for shutting down or turning off the machine, equipment or system. The procedure may reference and existing Standard Operating Procedure.

(6). The location of all energy isolation devices that are needed to control the energy shall be noted or referenced in an attached drawing/schematic.

(7). The specifics sequence (if necessary) that the control devices need to be activated/deactivated or how they need to be operated.

(8). Specific requirements for testing the machine/equipment or system to verify that all potentially hazardous stored or residual energy is relieved, disconnected, restrained, and otherwise rendered safe.

(9). The steps for removing control devices.

(10). Specific procedures to control shift or personnel changes to ensure the continuity of the lockout. If required it shall include provisions for the orderly transfer of locks between off-going and oncoming shifts.

(11). Approving officials by name to include each of the Safety Operator(s) participating in the lockout and another employee acceptable to the Safety Operator as being knowledgeable of the system being locked-out.

3.5.2 NASA Langley Form 496, Lockout/Tagout Records

a. NASA Langley Form 496, "Lockout/Tagout Records," shall be used as a tool by the facility as an ongoing log to indicate the active and historical lockout condition(s) in the facility. Entries recorded in the log shall be kept for a minimum of one year. This form shall be used anytime the RL/RT method is used. Information required on the Lockout Records Log is as follows:

(1). **Tag No.** - The serial number of the red identification tag issued to the Safety Operator.
(2). **Date Tag Issued** - The date the red identification tag is written to the Safety Operator.
(3). **Facility Coordinator** – The FC or their designee that issues the RED tag to the Authorized Safety Operator.
(4). **Safety Operator** – The authorized Safety Operator locking out the system.
(5). **To Whom Issued** – The name of the employee the RED tag is written to. It could be a Protected Employee in the case of a single lockout or it could be the Responsible Employee in the case of a group lockout.
(6). **Location of Tag** – Identify where the locked-out isolation device is located. (Note: be as specific as possible noting the location)
(7). **Personal Locks Out/In** – Number of Personal locks issued to the responsible/protected employee.
(8). **Work to be performed and the System** – Briefly describe the system and the servicing being done.
(9). **Lock Box** – Number of the lockbox. (In a Lockout with multiple isolation devices being locked and tagged the lock box shall be labeled and identified)
(10). **Procedure No. NASA Langley Form 495** - Record the procedure number (if a documented procedure is required).
(11). **Facility Coordinator** – The FC or their designee authorizing the removal of the lockout device.
(12). **Safety Operator** – The authorized Safety Operator removing the lockout device.
(13). **Date Tag lifted** – The date the lockout device is removed.

3.5.3 RED IDENTIFICATION TAGS

a. The Safety Operator shall complete the information requested on the red identification tag. The white backing on the top half of the form shall be peeled off and the protection window placed over the information to protect it from the environment. The bottom stub shall be removed at the perforation and given to the Responsible/Protected employee. Clarification of information required on the red identification tag is as follows:

(1). **Location** - Building/facility name or number.
(2). **Date** - Date when the lockout is applied.
(3). **Equipment** - Name of the machine/equipment or system being locked-out.
(4). **Tagged For:** - Who the tag is issued to.
- **Name** - The Responsible/Protected Employee or N/A if applied for yourself
- **Section** - Organization responsible for the lockout
- **Telephone** - Contact number of the Responsible Employee

(5). **Time** - Time the lockout was applied.
(6). **Remarks** - Any pertinent notes.
(7). **Locked/Tagged By** - Safety Operator that locked-out the isolation device.

b. The above information is repeated on the bottom half or stub section of the tag along with the name of the Responsible/ Protected Employee accepting the stub and key and the date accepted.

(1). **Reported Clear** - The time and date the lock and lockout devices were removed from the energy isolation device.
(2). **Returned to Service** - N/A
(3). **Cleared By** - The Safety Operator that removed the lockout devices.

3.5.4 NASA Langley Form 493, Lockout/Tagout Release (Without Red Tag Stub or Removal of Personal Lock by authorized personnel)

a. Anytime a personal lock is removed from a lock box by someone other than the employee who applied that lock or if a red lock is removed from an energy control device without reuniting it with the red tag stub it shall be done with approval documented on the NASA Langley Form 493. When completing the NASA Langley Form 493:

- When a worker is not available and forgot to remove their personal lock or in an emergency situation, the lock may be removed by documenting the following steps:

(1). Verify that the employee that applied the lock is not in the facility.
(2). Make sure every effort to contact the employee has been made before his or her lock is removed.
(3). Explain briefly what is being done to notify the individual (before he returns to area) that their lock was removed and the status of the lockout.
(4). The employees Supervisor will approve the removal of a personal lock from the lockbox by someone other than the employee who applied the lock/ tag out device with the NASA Langley Form 493.

- Any time a red tag stub is not available for the Safety Operator's verification for the release of the lockout, the release shall be documented on NASA Langley form 493. The facilities Supervisor shall:

(1) Verify that the equipment, machine or system has been properly reassembled, the servicing work is complete and the employee(s) no longer need lockout protection.
(2) Briefly explain why the red tag stub is not available.

Chapter 4

4. AUTHORIZATION OF SAFETY OPERATORS AND SHOP MACHINE OPERATORS

4.1 DOCUMENTATION

a. The documents associated with the authorization of Safety Operators, Craft Specific Safety Operators and Shop Machine Operators are:

(1). NASA Langley Form 451, "Safety Operator Appointment Form"
(2). NASA Langley Form 453, “Safety Operators Permit”

4.2 AUTHORIZATION PROCESS

a. Candidates for the SO, CSSO or SMO (both civil servants and on site-contractors) shall be recommended by their supervisor by completing NASA Langley Form 451 and forwarding to LaRC Safety Manager.

b. The candidate shall understand the procedural requirements of this LPR.

c. The Supervisor shall ensure the recommendation provides sufficient detail defining type of energy, the maximum energy level, the building(s)/facility(s), and the machine/equipment/or system that the employee will be authorized to lockout. Any one or a combination of the following descriptive examples could be used:

(1). Authorized to lockout electrical energy above 600 volts and above at any LaRC substation.
(2). Authorized to lockout electrical energy below 600 volts at the National Transonic Facility.
(3). Authorized to lockout pneumatic pressure systems up to 125 psi in building 1195.
(4). Authorized to lockout steam pressure systems up to 2500 psi in the steam generation facility.
(5). Authorized to lockout devices controlling electrical energy that is below 600 volts to do mechanical repair, servicing, or maintenance of mechanical components/systems.
(6). For all the energy sources associated with the laser system for the Aerospace Research Project.
(7). For any HVAC energy control devices at LaRC limited to 220 volts and 125 psi. (**This would be for CSSO’s appointment**).
(8). For the Cincinnati Brake machine in building 1232A. (**This would be for and SMO’s**).
(9). Authorized to lockout electrical energy below 600 volts for mechanical work.

d. The Supervisor shall document the candidate's qualifications on NASA Langley Form 451 and maintain a record of the candidates training and experience with the machine, equipment or system they are seeking authorization.

e. The LaRC Safety Manager shall review the candidate's qualifications and process the appointment form.

(1). Candidates that have the required qualifications for CSSO and SMO authorization will be tested. Upon passing the test CSSO will be issued a BLUE authorization card and SMO's will be issued a YELLOW authorization card.

(2). A Craft Specific Safety Operator must be an authorized Safety Operator.

f. Candidates seeking authorization for SO shall:

(1). Meet the qualification requirements (section 4.3)
(2). Successfully demonstrate to a Field Verifier their knowledge of both this document and their ability to control and lockout energy on the equipment/systems they are seeking authorization.
(3). Pass a written test administered by the LaRC Safety Manager.

g. Upon satisfying paragraph (f) above the LaRC Safety Manager shall issue a NASA Langley Form 453, "NASA Langley Safety Operator's Permit," that is valid for 4 years from the date on the permit.

h. The LaRC Safety Manager and Field Verifier shall ensure SO's understand that their safety and the safety of the Protected Employee's depends on their ability to lockout a system safely and they have the authority and responsibility to refuse to lockout a system if they feel they are not qualified to do so or for any reason they think their safety or the Protected Employee's safety will be compromised.

i. The LaRC Safety Manager or his/her designee shall keep NASA Langley Form 451, along with the results of the written test on file.

4.3 SAFETY OPERATOR QUALIFICATIONS

a. A Safety Operator shall be a civil servant or an "on-site" non-personal services contractor who has experience on the equipment or type of equipment to which RL/RT lockout may be performed. Evidence to support qualification as a Safety Operator shall be by one of the following:

(1). Licensed as a Journeyman Tradesman in the State of Virginia or other governmental jurisdiction with licensing requirements equivalent to the State of Virginia. In addition to the Journeyman License, a SO shall have

one year of relevant experience after the date of first licensing on equipment or type of equipment to which LO/TO will be performed. The experience shall be acceptable to the Contract Manager for NPS contractor employees or the Organizational Unit Manager or his/her designee for civil servants and concurred with by the LaRC Safety Manager.

(2). Completion of a United States Department of Labor apprenticeship as evidenced by a Certificate of Completion of Apprenticeship. In addition to the Certificate of Completion of Apprenticeship, a SO shall have one year of relevant experience after the date of completion of the apprenticeship on equipment or type of equipment to which LO/TO will be performed. The experience shall be acceptable to the Contract Manager for NPS contractor employees or the Organizational Unit Manager or his designee for civil servants and concurred with by the LaRC Safety Manager.

(3). Six years of relevant practical experience on the equipment or type of equipment to which LO/TO will be performed. The experience shall be acceptable to the Contract Manager for NPS contractor employees or the Organizational Unit Manager or his designee for civil servants and concurred with by the LaRC Safety Manager.

(4). Direct involvement in the development and construction or assembly of a particular research apparatus or facility with appropriate knowledge of the research apparatus or facility that would allow the individual to safely perform lockout/tagout on the particular research apparatus or facility. The direct involvement shall be acceptable to the Contract Manager for NPS contractor employees or the Organizational Unit Manager or his designee for civil servants and concurred with by the LaRC Safety Manager.

(5). Demonstrated knowledge of the characteristics, operation, and hazards of the specific facility, system(s), or class of equipment for which the individual will be authorized to perform lockout/tagout. Supporting and documentation shall be attached to the Safety Operator Appointment Form (LF 451). The supporting documentation Shall conform with the candidate's:

a. Ability to locate, read, and understand applicable schematic drawings. (list drawing numbers)
b. Ability to locate and identify key system components in the field. (List specific components)
c. Knowledge of the system or equipment operation. (Qualifications as a level 1or level 2 certified operator or a statement to that the candidate has satisfactorily described the operation to his supervisor and the associated Facility Safety Head).
d. Ability to safely start-up and shutdown of systems or equipment. (List of SOP's demonstrated or equipment operated)

e. Ability to identify hazards associated with the facility, systems, or class of equipment. (List of the systems or class of equipment and hazards identified by candidate)

The supporting documentation shall be signed by the candidate's supervisor and associated Facility Safety Head to confirm that the candidate has demonstrated the listed knowledge and abilities. The documented evidence of the candidate's knowledge and ability shall be acceptable to the Contract Manager for NPS contract employees or the organizational unit manager or his designee for civil servants and concurred with by the LaRC Safety Manager.

Chapter 5

5. AUTHORIZATION PROCESS AND QUALIFICATIONS FOR A SAFETY OPERATOR FIELD VERIFIER (FIELD VERIFER)

5.1 DOCUMENTATION

The document associated with the authorization of a Field Verifier is:

- NASA Langley Form 519, “Safety Operator Field Verifier Appointment Form."

5.2 FIELD VERIFIER AUTHORIZATION PROCESS

a. The procedure for certification as a Safety Operator Field Verifier:

(1). An employee’s supervisor shall initiate a NASA Langley Form 519, "Safety Operator Field Verifier Appointment Form."

(2). Both the LaRC Safety Manager and the appropriate Standard Practice Engineer shall concur that the employee’s qualifications are acceptable.

(3). Recommendations shall be presented to the LaRC Executive Safety Council for appointment.

(4). The LaRC Safety Manager shall maintain on file the approved NASA Langley Form 519 along with the minutes from the Executive Safety Council meeting.

5.3 FIELD VERIFIER QUALIFICATIONS

a. A Safety Operator Field Verifier shall be a technical subject matter expert in the field that Safety Operator Candidates are to be certified. A Safety Operator Field Verifier shall be or have been a NASA Safety Operator. Evidence to support qualification as a technical subject matter expert shall be by one of the following:

(1). Licensed as a Master Tradesman in the State of Virginia or other governmental jurisdiction with licensing requirements equivalent to the State of Virginia. In addition to the license as a Master Tradesman in the State of Virginia, the Safety Operator Field Verifier shall have 2 years of relevant experience after the date of first licensing on equipment or type of equipment to which Safety Operator candidates will be certified to perform RL/RT lockout. The experience shall be acceptable to the Contract Manager for non-personal support contractor employees or to the Organizational Unit Manager or his/his designee for civil servants and concurred with by the LaRC Safety Manager.

(2). Completion of a United States Department of Labor apprenticeship as evidenced by a Certificate of Completion of Apprenticeship. In addition to the Certificate of Completion of Apprenticeship, the Safety Operator Field Verifier shall have 3 years of relevant experience after completion of the apprenticeship on equipment for the type of equipment on which Safety Operator candidates will be certified to perform RL/RT lockout. The experience shall be acceptable to the Contract Manager for a non-personal support contractor employee or to the Organizational Unit Manager or his/her designee for a civil servant and concurred with by the LaRC Safety Manager.

(3). Ten years of relevant experience acceptable to the Contract Manager for a non-personal support contractor employee or to the Organizational Unit Manager or his/her designee for a civil servant on the equipment or type of equipment to which Safety Operator candidates will be certified to perform RL/RT lockout.

(4). Ten years of a combination of education (30 college credits substituted for one year of relevant experience) and relevant experience on the equipment or type of equipment to which Safety Operator candidates will be certified to perform Lockout/Tagout that is acceptable to the Contract Manager for a non-personal support contractor employee or to the Organizational Unit Manager or his/her designee for a civil servant. The LaRC Safety Manager shall concur with the experience.

5.4 FIELD VERIFIER RESPONSIBILITIES

The Field Verifier shall:

a. Verify that the recommended employee seeking authorization has a working knowledge of system(s), the energy sources and hazards of those systems and the controls required for effective lockout.

b. Verify that the recommended employee understands requirements of this LPR.

c. Ensure the SO understands that their safety and the safety of the Protected Employee’s depend on their ability to lockout a system safely and they have the authority and responsibility to refuse to lockout a system if they feel they are not qualified to do so or for any reason they think their safety or the Protected Employee’s safety will be compromised.

Appendix A

DEFINITIONS

Capable of Being Locked-Out - An energy isolating device capable of being locked - out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked-out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability.

Energized - Connected to an energy source or containing residual or stored energy.

Energy Isolating Device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: a manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductor, and in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy Source - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Group Lockout - A group lockout is when maintenance, repair or service is performed by an employee(s) other than the employee(s) that locked-out the machine or system.

Hot Tap - A procedure used repair, maintenance and service activities, which involves welding on a piece of equipment (pipelines, vessels or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout - The placement of a lockout device on an energy-isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

Protected Employee or Affected Employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Responsible Employee – An authorized employee that accepts primary responsibility for a set number of employees working under the protection of a group lockout.

Safety or Shop Machine Operator or Authorized Employee A person who locks out or tags out machines, equipment or systems in order to perform servicing or maintenance on that machine or equipment.

Servicing and/or Maintenance - Workplace activities, such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines, equipment or systems. These activities include lubrication, cleaning or unjamming of machines, equipment or systems and making adjustments or tool changes, where the employee may be exposed to the **unexpected** energization or startup of the equipment or release of hazardous energy.

Setting Up - Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout - The placement of a tagout device on an energy-isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.